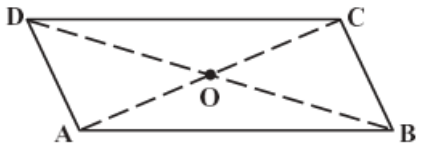
CLASS NOTES-ANSWERS

EXERCISE 3.3

1. Given a parallelogram ABCD. Complete each statement along with the definition or property used.

   (i) AD = ... (ii) ∠ DCB = ...

   (iii) OC = ... (iv) m ∠DAB + m ∠CDA = ...



Answer:

(i) The opposite sides of a parallelogram are of equal length.

AD = BC

(ii) In a parallelogram, opposite angles are equal in measure.

∠DCB = ∠DAB

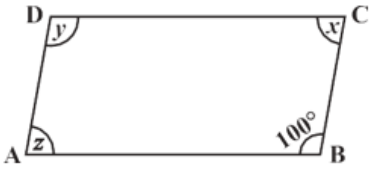
(iii) In a parallelogram, diagonals bisect each other. Hence,

OC = OA

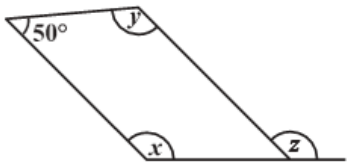
(iv) In a parallelogram, adjacent angles are supplementary to each other.

m∠DAB + m∠CDA = 180°

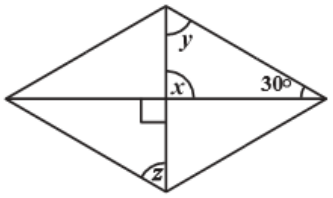
2. Consider the following parallelograms. Find the values of the unknowns x, y, z.



(i)

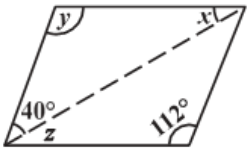


(ii)



(iii)

(iv)



(v)

Answer:

(i) $y = 100^{\circ}$ [Since opposite angles of a parallelogram are equal]

$\angle C + \angle B = 180^{\circ}$ (The adjacent angles in a parallelogram are supplementary)

$x + 100^{\circ} = 180^{\circ}$ (The adjacent angles in a parallelogram are supplementary)

$x = 180^{\circ} - 100^{\circ} = 80^{\circ}$

$x = z = 80^{\circ}$ [Since opposite angles of a parallelogram are equal]

(ii) $x + 50^{\circ} = 180^{\circ}$ (The adjacent angles in a parallelogram are supplementary)

$x = 180^{\circ} - 50^{\circ} = 130^{\circ}$

$x = y = 130^{\circ}$ (Since opposite angles of a parallelogram are equal)

$x = z = 130^{\circ}$ (Corresponding angles)

(iii) $x + y + 30^{\circ} = 180^{\circ}$ (Angle sum property of triangles)

$x = 90^{\circ}$ (Vertically opposite angles)

$90^{\circ} + y + 30^{\circ} = 180^{\circ}$

$y + 120 = 180^{\circ}$

$y = 60^o$

$z = y = 60^o$ (Alternate interior angles are equal)

(iv) $z = 80^o$ (Corresponding angles)

$y = 80^o$ (since opposite angles of a parallelogram are equal)

$x + y = 180^o$ (Adjacent angles are supplementary)

$x + 80^o = 180^o$

$x = 180^o - 80^o$

$x = 100^o$

(v) $y = 112^o$ (Since opposite angles of a parallelogram are equal)

$x + y + 40^o = 180^o$ (Angle sum property of triangles)

$x + 112^o + 40^o = 180^o$

$x + 152^o = 180^o$

$x = 180^o - 152^o$

$x = 28^o$

$z = x = 28^o$ (Alternate interior angles are equal)

3. Can a quadrilateral ABCD be a parallelogram if

(i) $\angle D + \angle B = 180°$?

(ii) AB = DC = 8 cm, AD = 4 cm and BC = 4.4 cm?

(iii) $\angle A = 70°$ and $\angle C = 65°$?

Answer:

(i) $\angle A + \angle B + \angle D + \angle C = 360^o$

$\angle A + \angle C + 180^o = 360^o$

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$\angle A + \angle C = 360^o - 180^o$

$\angle A + \angle C = 180^o$ (Opposite angles should also be of same measures.)

For $\angle D + \angle B = 180°$, is a parallelogram.

If the following conditions is fulfilled, then ABCD is a parallelogram.The sum of the measures of the adjacent angles should be 180^o.

Opposite angles should also be of same measure.

(ii) Property of parallelogram: The opposite sides of a parallelogram are of equal length.Opposite sides AD and BC are of different lengths. So, it's not parallelogram.

(iii) Property: In a parallelogram opposite angles are equal.

So, $\angle A = 70°$ and $\angle C = 65°$ are not equal.

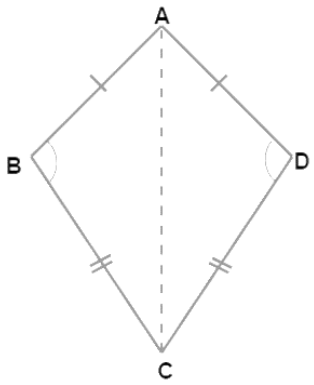
So ABCD is not parallelogram.

4. Draw a rough figure of a quadrilateral that is not a parallelogram but has exactly two opposite anglesof equal measure

Answer:

In a kite, the angle between unequal sides are equal.

The quadrilateral ABCD is not a parallelogram as the measures of the remaining pair of opposite angles, $\angle A$ and $\angle C$, are not equal. Since they form angle between equal sides.



5. The measures of two adjacent angles of a parallelogram are in the ratio 3 : 2. Find the measure of each of the angles of the parallelogram.

Answer:

The sum of the measures of adjacent angles is 180° for a parallelogram.

$\angle A + \angle B = 180^\circ$

$3x + 2x = 180^\circ$

$5x = 180^\circ$

$x = 36^\circ$

$\angle A = \angle C = 3x = 108^\circ$ (Opposite angles)

$\angle B = \angle D = 2x = 72^\circ$ (Opposite angles)

Thus, the measures of the angles of the parallelogram are 108°, 72°, 108°, and 72°.

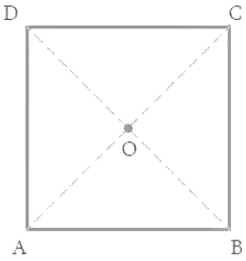
6. Two adjacent angles of a parallelogram have equal measure. Find the measure of each of the angles of the parallelogram.

Answer:

In parallelogram ABCD,

$\angle A$ and $\angle D$ are supplementary since DC is parallel to AB and with

transversal DA, making ∠A and ∠D interior opposite.



∠A and ∠B are also supplementary since AD is parallel to BC and with transversal BA, making ∠A and ∠B interior opposite.

Sum of adjacent angles = 180°

Let each adjacent angle be x

Since the adjacent angles in a parallelogram are supplementary.

$x + x = 180°$

$2x = 180°$

$x = 90°$

Hence, each adjacent angle is 90.

$\angle A = \angle B = 90°$ (adjacent angles)

$\angle C = \angle A = 90°$ (Opposite angles)

$\angle D = \angle B = 90°$ (Opposite angles)

Thus, each angle of the parallelogram measures 90°.

7. The adjacent figure HOPE is a parallelogram. Find the angle measures x, y and z. State the properties you use to find them.

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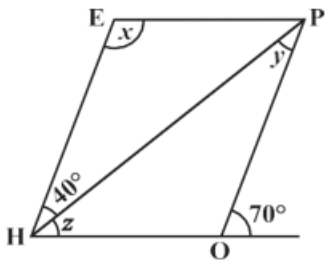

Answer:

$\angle HOP + 70° = 180°$ [Angles of linear pair]

$\angle HOP = 180° - 70°$

$\angle HOP = 110°$

$\angle HOP = \angle E$ (opposite angles are equal)

$\therefore x = 110°$

$y = 40°$ (Alternate interior angles are equal)

$z + 40° = 70°$ (Corresponding angles)

$z = 70° - 40°$

$z = 30°$

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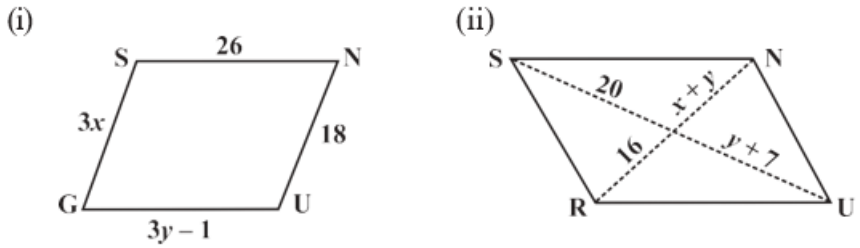
8. The following figures GUNS and RUNS are parallelograms. Find x and y. (Lengths are in cm)



Answer:

(i) In a parallelogram, the opposite sides have same length.

- SG = NU

$3x = 18$

$x = 6$

- $SN = GU$

  $26 = 3y - 1$

  $3y = 26 + 1$

  $y = 9$

Hence, the measures of x and y are 6 cm and 9 cm respectively.

(ii) The diagonals of a parallelogram bisect each other.

- $y + 7 = 20$

  $y = 20 - 7$

  $y = 13$

- $x + y = 16$

  $x + 13 = 16$

  $x = 16 - 13$

  $x = 3$

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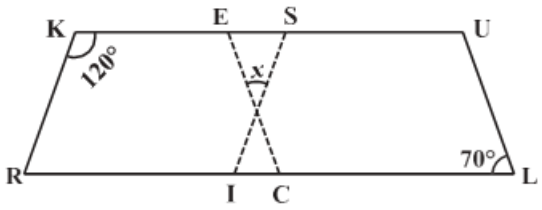
Hence, the measures of x and y are 3 cm and 13 cm respectively.

9.



In the above figure both RISK and CLUE are parallelograms. Find the value of x.

Answer:

In parallelogram RISK,

$\angle RKS + \angle ISK = 180°$ [pair of adjacent angles are supplementary]

$120° + \angle ISK = 180°$

$\angle ISK = 180° - 120°$

$\angle ISK = 60°$

$\angle RIS = \angle K = 120°$ (In parallelogram opposite angles are equal)

In parallelogram CLUE,

$\angle L = \angle CEU = 70°$ (In parallelogram opposite angles are equal)

The sum of the measures of all the interior angles of a triangle is 180º.

$x + 60^o + 70^o = 180^o$

$x + 130^o = 180^o$

$x = 180^o - 130^o$

$x = 50^o$

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10. Explain how this figure is a trapezium. Which of its two sides are parallel?

(Fig 3.32)

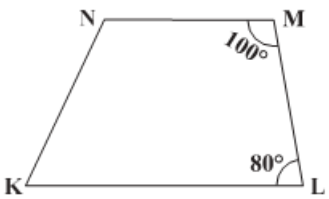

Fig 3.32

Answer:

In the given figure KLMN,

$\angle L + \angle M = 180°$ [two pair of adjacent angles are supplementary]

$80°+100° = 180°$

Therefore, MN is parallel to KL

Hence, KLMN is a trapezium as it has a pair of parallel sides KL and MN.

11. Find $m\angle C$ in Fig 3.33 if $AB \parallel DC$.

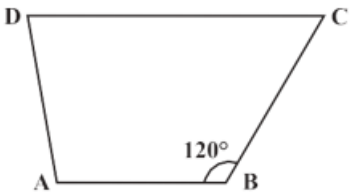

Fig 3.33

Answer:

Given figure ABCD is a Trapezium, in which AB is parallel to DC.

$\angle B + \angle C = 180°$ [pair of adjacent angles are supplementary]

$120° + \angle C = 180°$

$\angle C = 180° - 120°$

$\angle C = 60°$

Therefore, $m\angle C = 60°$

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12. Find the measure of $\angle P$ and $\angle S$ if $SP \parallel RQ$ in Fig 3.34. (If you find $m\angle R$, is there more than one method to find $m\angle P$?)

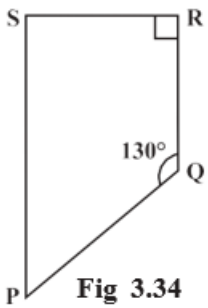

Fig 3.34

Answer:

Given SP is parallel to RQ and SR is the traversal drawn to these lines.

Hence,

$\angle S + \angle R = 180^o$

$\angle S + 90^o = 180^o$

$\angle S = 180^o - 90^o$

$\angle S = 90^o$

Using the angle sum property of a quadrilateral,

$\angle S + \angle P + \angle Q + \angle R = 360^o$

$90^o + \angle P + 130^o + 90^o = 360^o$

$\angle P + 310^o = 360^o$

$\angle P = 360^o - 310^o$

$\angle P = 50^o$

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Alternate Method:

$\angle P + \angle Q = 180^o$ (adjacent angles)

$\angle P + 130^o = 180^o$

$\angle P = 180^o - 130^o$

$\angle P = 50^o$

$\angle S + \angle R = 180^o$ (adjacent angles)

$\angle S + 90^o = 180^o$

$\angle S = 180^o - 90^o$

$\angle S = 90^o$

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